CLAIMS

What is claimed is:

1. A steel body rotary drag bit for drilling a subterranean formation, comprising:

a steel bit body having a centerline and including a leading end having generally radially extending blades for contacting a formation during drilling;

a cutting element pocket comprising a substantially arcuate surface and a substantially planar surface for attaching a cutting element thereto;

a cutting element having a substantially cylindrical body, a cutting face, and a substantially planar surface distal to the cutting face affixed within the cutting element pocket; and

wherein the cutting element pocket comprises a support element affixed to the bit body, wherein the support element forms at least the substantially planar surface of the cutting element pocket and is configured to matingly engage at least a portion of the substantially planar surface of the cutting element distal to the cutting face thereof.

2. The steel body rotary drag bit of claim 1, wherein the support element is affixed to the bit body by at least one of welding, brazing, press-fit, and shrink-fit.

3. The steel body rotary drag bit of claim 1, wherein the support element is sized and configured to support the cutting element against forces applied thereto during drilling.

4. The steel body rotary drag bit of claim 1, wherein the at least one cutting element comprises a polycrystalline diamond compact.

5. The steel body rotary drag bit of claim 1, wherein the support element comprises steel or tungsten carbide.

6. The steel body rotary drag bit of claim 1, wherein the support element includes an aperture and is affixed to the bit body by way of an anchor element extending therethrough.

7. The steel body rotary drag bit of claim 6, wherein the anchor element is press-fit into a retention recess within the bit body.

8. The steel body rotary drag bit of claim 6, wherein the anchor element is deformed within at least one of the aperture of the support element and a retention recess in the drill bit.

9. The steel body rotary drag bit of claim 2, wherein the support element forms more than one surface of the cutting element pocket.

10. The steel body rotary drag bit of claim 9, wherein the support element is configured to contact at least a portion of the circumference of the cutting element.

11. The steel body rotary drag bit of claim 9, wherein the support element forms substantially the entire cutting element pocket.

12. The steel body rotary drag bit of claim 9, wherein the support element is press fit into a retention recess formed within the drill bit body.

13. The steel body rotary drag bit of claim 1, further comprising a secondary structure affixed to the steel drill bit body disposed within a cavity positioned rotationally trailing the support element.

14. The steel body rotary drag bit of claim 13, wherein the secondary structure comprises tungsten carbide.

15. The steel body rotary drag bit of claim 1, wherein the cutting element pocket surrounds more than half of a cross-sectional circumference of the cutting element disposed therein.

16. The steel body rotary drag bit of claim 15, wherein the support element is affixed to the bit body by at least one of welding, brazing, press-fit, and shrink-fit.

17. The steel body rotary drag bit of claim 15, wherein the support element includes an aperture and is affixed to the bit body by way of an anchor element extending therethrough.

18. The steel body rotary drag bit of claim 15, wherein the support element is configured to contact at least a portion of the circumference of the cutting element.

19. The steel body rotary drag bit of claim 18, wherein the support element forms substantially the entire cutting element pocket.

20. A method of manufacturing a steel body rotary drag bit, comprising:

providing a steel bit body having a centerline and including a leading end having a plurality of generally radially extending blades for contacting a formation during drilling;

forming a cutting element pocket, the forming comprising:

forming a recess extending at least partially between the leading face and trailing face of at least one generally radially extending blade; and

forming a retention recess that at least partially intersects the recess within the at least one generally radially extending blade;

wherein forming a cutting pocket comprises forming a substantially arcuate surface and a substantially planar surface for matingly engaging at least a portion of a substantially planar surface of a generally cylindrical cutting element distal to the cutting face thereof;

wherein the support element affixed to the bit body by way of the retention recess forms at least the substantially planar surface of the cutting element pocket;

providing a cutting element having a substantially cylindrical body, a cutting face, and a substantially planar surface distal to the cutting face;

abutting the substantially planar surface distal to the cutting face of the cutting element with the substantially planar surface of the cutting element pocket; and

affixing a support element to the steel bit body by way of the retention recess.

21. The method of claim 20, further comprising affixing a generally cylindrical cutting element within the cutting element pocket.

22. The method of claim 20, wherein affixing the support element to the bit body comprises deforming an anchor element therethrough,

23. The method of claim 20, wherein affixing the support element to the bit body comprises deforming an anchor element thereagainst.

24. The method of claim 20, wherein affixing the support element to the bit body comprises deforming an anchor element within the retention recess.

25. The method of claim 20, wherein affixing the support element to the bit body comprises affixing the support element to the bit body comprises at least one of welding, brazing, press-fitting, and shrink-fitting.

26. The method of claim 20, wherein affixing the support element to the bit body forms substantially the entire cutting pocket.

27. A method of repairing a steel body rotary drag bit, comprising:

providing a steel bit body having a centerline and including a leading end having a plurality of generally radially extending blades for contacting a formation during drilling;

forming a cutting element pocket, the forming comprising:

forming a recess extending at least partially between the leading face and trailing face of at least one of the plurality of generally radially extending blades;

forming a retention recess that at least partially intersects the recess within the at least one generally radially extending blade; and

affixing a support element to the steel bit body by way of the retention recess;

wherein forming a cutting pocket comprises forming a substantially arcuate surface and a substantially planar surface for matingly engaging at least a portion of a substantially planar surface of a generally cylindrical cutting element distal to the cutting face thereof;

providing a cutting element having a substantially cylindrical body, a cutting face, and a substantially planar surface distal to the cutting face;

abutting the substantially planar surface distal to the cutting face of the cutting element with the substantially planar surface of the cutting element pocket;

affixing the cutting element within the cutting element pocket;

drilling with the steel body rotary drill bit

removing the cutting element; and

replacing the cutting element with another cutting element.

28. The method of claim 27, wherein affixing the support element to the bit body comprises at least one of welding, brazing, press-fitting, and shrink-fitting.

29. The method of claim 27, wherein affixing the cutting element within the cutting element pocket comprises affixing a polycrystalline diamond compact within the cutting element pocket.

30. The method of claim 29, wherein replacing the cutting element with another cutting element comprises affixing another polycrystalline diamond compact within the cutting element pocket.

31. The method of claim 27, wherein replacing the cutting element with another cutting element comprises removing the support element and replacing the support element with another support element.